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If you are responsible for a government facility, how will you provide services and fulfill your mission if the books don't balance? Your facility's utility bills continue to climb while your budget is shrinking.

**N**ot only is some of your existing equipment wasting energy, there is no clear financial relief in sight to replace it. In addition, you are compelled to meet Energy Policy Act (EPACT) requirements to reduce energy consumption from 1985 levels by 20 percent in 2000 and 30 percent by 2005!

But the technical, economic, legal, and contractual maze of Energy Management takes a lot of effort and analysis—activities that your busy staff probably does not have the time to do. Consider temporarily expanding your federal staff and “borrowing” some of FETC's energy experts.

FETC provides our federal government colleagues with comprehensive technical, business, and economic services to satisfy their

energy savings requirements. We understand advanced electric-generating and natural-gas technologies, and we have developed our own Energy Management Plan.

Our recipe includes key ingredients and key instructions; you can choose to follow part or all of the recipe to meet your needs.

### Strategize

**Devise a Site Energy Strategy:** A Site Energy Strategy ensures that the best technical options have been explored and your special energy and environmental needs are fully addressed.

FETC will provide unbiased, objective, technical analyses to answer your critical questions:

- What energy conservation measures (ECMs) should be pursued first?
- How can energy management activities be coordinated with plans for facility expansion or improvement?
- How can your site improve its environmental performance?
- Should you switch fuels?
- Does your power quality need to be improved?
- Do you have adequate backup power capacity?
- Is self-generation of electricity feasible, both technically and economically?
- If so, which power-generation technologies would work best?
- Is cogeneration attractive?

## Recipe for Energy Savings

### Energy Savings Recipe

#### Key Ingredients:

ECM—energy conservation measure

EPACT—Energy Policy Act

ESP—energy savings performer

ESPC—energy savings performance contract

RESEP—Regional Environmental and Sustainable Energy Partnership

#### Key Instructions:

**Strategize** Devise a site energy strategy, Conduct a preliminary energy survey, Assess potential ECMs

**Measure** Determine energy-usage baseline, Prepare a technical data package, Measure and Verify

**Manage** Select an option, Administer the agreement, Manage the project

We consider the whole picture. We have a unique understanding of advanced technologies in environmental management, emissions control, power generation, and innovative ECMs from both sides—through experimental validation and experience in project management.

**Conduct a Preliminary Energy Survey:** FETC will conduct a preliminary survey of your site to gather the basic information needed to define your energy management program.

Typically, the survey will focus on the following areas: heating/ventilating/air-conditioning systems, lighting, motors, and water systems.

**Assess Potential ECMs:** FETC will perform a detailed technical and economic assessment of your most promising ECMs. We will use building and systems simulation software to evaluate your potential cost savings and identify short- and long-term energy management goals. Many ECMs are interactive, and our advanced tools can account for this interaction.

The assessment will recommend options and estimate the energy cost savings and simple payback period for each option. The assessment can be used later to judge the reasonableness and innovation of ECMs proposed by energy savings performers (ESPs).

## Measure

**Determine Energy Usage Baseline:** A facility's baseline energy usage is the foundation upon which future energy savings—and thus payments—are calculated. You need to define your energy-usage baseline as soon as possible so you can accurately calculate future energy savings.

FETC has no conflict of interest, so we can define the critical baseline you and your ESP use to calculate future energy savings. Using your energy-usage baseline, FETC will benchmark your usage against that of similar facilities nationwide.

FETC will divide your facility's total energy usage into convenient categories for calculating energy savings. Wherever existing metering is inadequate to characterize energy usage in a key area, FETC will recommend temporary or permanent new metering.

**Prepare a Technical Data Package:** FETC will use information from the preliminary energy survey, assessment of potential ECMs, your energy-usage baseline, and your needs and expectations to prepare a technical data package. Potential ESPs will use the package to submit proposals.

The package could define a limited-scope project, which simplifies the evaluation of competitive proposals and allows you to choose the best ESP. A robust technical data package also gives the selected ESP a significant

head start in understanding your facility from an energy systems perspective. This saves you both time and money. FETC will ensure that the project scope defined in the technical data package does not inhibit the accomplishment of additional projects.

**Measure and Verify:** ESPs are normally responsible for determining energy performance, and consequently, how much funding they recover. FETC will provide an objective check and validation of the energy performance.

FETC uses spot follow-up surveys, performed at least annually, to verify the measurements and reasonableness of the cost savings, based on the predetermined energy-usage baseline.

## Manage

**Select an Option:** FETC will help you evaluate your contracting alternatives by presenting the advantages and disadvantages of choosing:

- Energy Savings Performance Contracts (ESPCs),
- Utility Incentive Programs, or
- Competing Self-Financed ECMs.



Federal agencies can enter into ESPCs to implement energy conservation projects. The advantage to your facility is that the installation, commissioning, maintenance, and operation of the ECMs, as well as the associated training, are initially paid for by the selected ESP.

The ESP is paid through a share of the energy cost savings. At the end of the contract, the government


facility retains all subsequent savings and capital equipment.

The government facility saves energy and improves its infrastructure without any additional funding. ESPs earn a profit from energy cost savings, manufacturers of energy-efficient equipment realize product sales, utilities are not required to add capacity, and national energy security is strengthened through more efficient use of energy resources.

## Everybody wins!

FETC will also use its technical and procurement staff to help you evaluate and select the best ESP. For example, prior to the request for proposals, FETC will help you prepare scoring forms and criteria for evaluating proposals, references, and oral presentations.

**Administer the Agreement:** FETC will use its procurement authority to place the agreement or work with your procurement group. We will use our extensive and expert contract administration capability, and our financial and legal expertise, to place and oversee the procurement, financial, and legal aspects of your energy-savings performance project.

**Manage the Project:** FETC will serve as your extended technical staff to verify that work is performed to specifications and that the equipment is properly installed and commissioned. FETC also will review project status and cost reports and take corrective action if necessary. 

## FETC Point of Contact:

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## RESEP

FETC's recipe for energy savings is also RESEP.

The Regional Environmental and Sustainable Energy Partnership or RESEP (pronounced recipe) region is Western Pennsylvania, Eastern Ohio, Western Maryland, and North Central West Virginia.

FETC is stimulating the energy and environmental capabilities of the RESEP region by encouraging partnerships between regional government, industry, and academic organizations. Such partnerships can yield significant energy savings.

Historically, the focus of the RESEP region is energy—it is rich in fossil fuels; it is the location of the nation's first power plant; and America's steel, iron, coke, and glass industries all trace their roots to the region.

The intention is to establish the region as an internationally renowned hub for the research and development (R&D), design, manufacturing, finance, sales, operation, and export of advanced products, technologies, and services in the energy and environment sectors.

FETC acts as the coordinator of the RESEP, and FETC's recipe for energy savings in the RESEP is to expand the region's economic basis to include:

1. Energy vendors who will upgrade federal facilities.
2. R&D organizations such as universities who will design innovative ECMs.
3. Other organizations including local and state governments who will conduct similar energy-savings efforts.



## The Greenhouse Effect: Its Cause

Your car becomes an oven on sunny summer days if you roll the windows up tight. Why?

Sunlight's short wavelengths pass easily through window glass. When this light energy strikes your car's opaque interior, it is absorbed and reradiated as heat energy. The heat tries to pass back through the glass, but its longer wavelengths (infrared) are blocked by the glass. The trapped heat energy builds up and the temperature skyrockets, making your car a "solar oven."

This phenomenon is put to work in greenhouses, giving it the name "greenhouse effect."

Similarly, sunlight passes through Earth's atmosphere to the surface, where it is converted to heat. As the heat energy tries to radiate back into space through the atmosphere, it encounters various gases. Over 99 percent of the gases let the heat energy pass unimpeded.

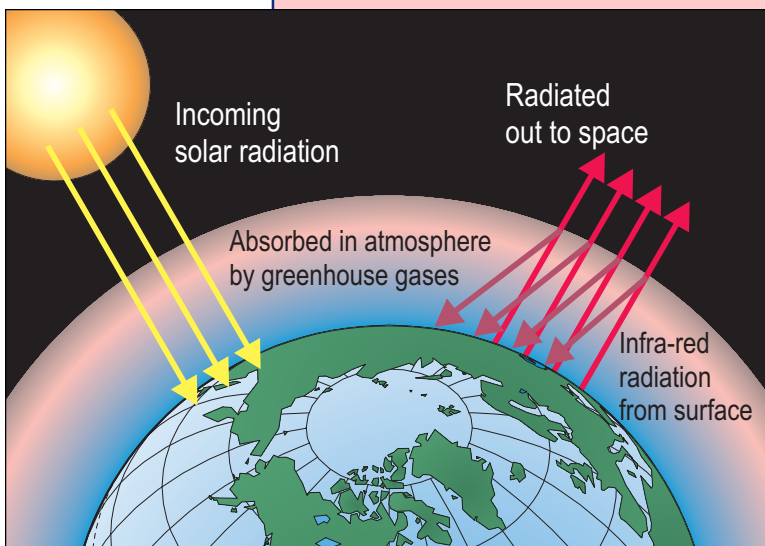
But a tiny fraction, the *greenhouse gases (GHGs)*, have molecules the right size and shape to absorb and retain the heat. These gases include water vapor, carbon dioxide ( $\text{CO}_2$ ), methane, and nitrous oxide. The retained heat builds up, causing a global-scale greenhouse effect and thus warming Earth's surface.

## The Greenhouse Gases

The most important human-generated GHGs are **carbon dioxide** ( $\text{CO}_2$ ) and **methane** ( $\text{CH}_4$ ), which is the chief component of natural gas. Less significant GHGs are nitrous oxide ( $\text{N}_2\text{O}$ ), ozone ( $\text{O}_3$ ), and some refrigerants (chlorofluorocarbons or CFCs like Freon™).

Water vapor actually is the most potent and variable greenhouse gas, but human-generated quantities are insignificant compared to natural humidity. Thus, the fossil-energy programs at the Federal Energy Technology Center (FETC) focus on  $\text{CO}_2$  and methane.

Most human-generated  $\text{CO}_2$  comes from combustion of coal, oil, and natural gas, which collectively contribute 80 percent of the increase in human-generated GHG. Human-released methane also comes from leaks in natural-gas plants and pipelines, and from coal seams that are disrupted by mining. Methane absorbs 27 times the heat energy of  $\text{CO}_2$ , but it is shorter-lived and scarcer, and thus is a less burly player on the greenhouse gas team.



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